

Excited structure with a very extended shape in ^{108}Cd

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Cranked Strutinsky calculations [1] predict very extended shape minima in ^{108}Cd with deformations larger than the superdeformed shapes observed in other mass regions. An experiment to search for such structures was performed with the Gammasphere spectrometer. High-spin states in ^{108}Cd were populated in the reaction $^{64}\text{Ni}(^{48}\text{Ca},4n)$ at a beam energy of 207 MeV with the beam provided by the ATLAS accelerator at Argonne National Laboratory.

A band associated with a very deformed shape was found in this experiment [2]. A lifetime analysis of this band resulted in a lower limit for the deformation corresponding to an axis ratio of $c/a > 1.8$, compared to the theoretical prediction of $c/a \simeq 2.3$. Since only a lower limit for the deformation could be given, the possibility that the band is associated with the predicted larger deformation cannot be ruled out.

The data also revealed a second, excited band in ^{108}Cd [3]. A spectrum of the excited band is shown in Fig. 1. The dynamic moments of inertia for both bands show a very similar behavior. However, the decay paths to normal deformed states could not be established, so that the spins of both bands remain unknown. The lifetime analysis for the excited band using the method of residual fractional Doppler shifts resulted in a quadrupole moment of $Q_0 = 8.5$ eb, which corresponds to an axis ratio of $c/a = 1.72$.

New calculations using the projected shell model [4] describe the dynamic moment of inertia very well. These calculations suggest a spin of $36\hbar$ for the lowest observed state in band 1, and assign this band as a proton $i_{13/2}$ two-quasiparticle structure coupled to $i_{13/2}$ neutrons. The $i_{13/2}$ proton intruder orbital is responsible for the superdeformed shapes in the $A \simeq 150$ region and in the $A \simeq 110$ region it may be classified as a ‘‘hyperintruder’’ level which is ex-

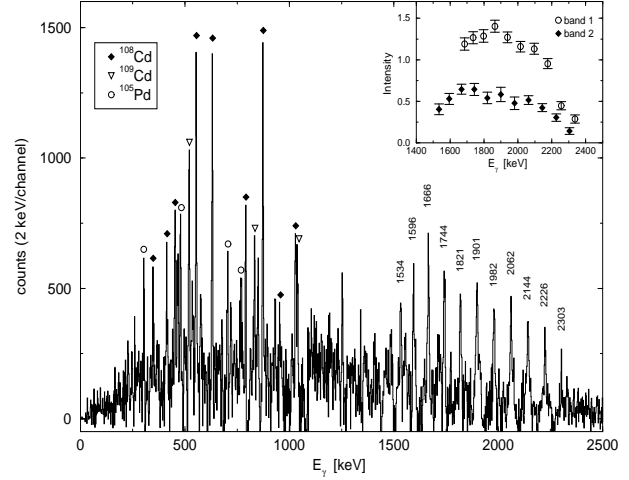


Figure 1: Spectrum of the excited band, band 2, in ^{108}Cd . The spectrum is gated on the in-band transitions which are labeled with their energies and shows coincidences with low-lying transitions in ^{108}Cd . The inset shows the intensities of the two bands in percent of the intensity of the reaction channel.

pected to be occupied at hyperdeformation.

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